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LETTERING  
FOR  
DRAFTSMEN, ENGINEERS AND STUDENTS

A PRACTICAL SYSTEM  
OF FREEHAND LETTERING FOR WORKING DRAWINGS.

BY  
CHAS. W. REINHARDT,

CHIEF DRAFTSMAN, ENGINEERING NEWS.

NEW YORK:  
D. VAN NOSTRAND COMPANY,  
1895.

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## P R E F A C E .

In looking over the books on lettering, which have come under the writer's notice, he has found, that while doing full justice to the principle of ornamentation and the theories governing the shaping of each letter, no author has as yet attempted to treat lettering from a purely practical point of view. The need of a practical work on lettering, however, has been and is daily experienced by many draftsmen, and in the following pages the writer has endeavored to set forth the proper methods of forming purely free-hand lettering in a simple easily acquired way, giving, at the same time, the proper safeguards against the errors most commonly committed. The letters exhibited are actual free-hand work and can readily be copied. In this respect the writer has made a radical departure from works of a similar character which generally give ornate carefully engraved alphabets, being of little more use to the average draftsman than ordinary printed type, i. e., they can only be copied with a great sacrifice of time and patience. The whole system outlined is the result of the writer's experience during years of practice on the staff of a leading technical journal and is intended to be a thoroughly practical guide for doing the best class of work in the shortest possible time.

BROOKLYN, *September*, 1895.

CHAS. W. REINHARDT.



## INCLINED LETTERING.

IN the following system of lettering no attempt has been made to imitate any special form of printed alphabet, and for all ornate and elaborate lettering the draftsman is referred to some one of the many published collections of this character. What is here intended is to illustrate and describe a type of lettering that looks well upon working drawings; is reduced to its simplest form; one that is rapidly made and is clear and distinct under almost any reduction by photography. It is, in fact, especially designed for photo-reproduction. With the purpose of fairly treating the subject, the lettering here illustrated has been reproduced without any attempt at touching up or cleaning; it is actual free-hand work, such as should be used in general practice.

The ordinary slanting and, further on, the upright lettering are described in a somewhat detailed manner, as when the draftsman once becomes proficient

in forming these two types properly, it will then be a very easy matter for him to form also the more ornamental letters satisfactory. The first requisite is to produce sharp, clean corners and bold lines of uniform strength, and this is especially necessary in work for photo-reproduction, as usually such unimportant looking things as filled-in corners and uneven lines are greatly exaggerated on the plate. In Fig. 1 the correct and incorrect ways of doing this are shown. It will be well at first, for the purpose of obtaining clean corners, to re-

*One Stroke Lettering*  
Incorrect.

*One Stroke Lettering*  
Correct.

*One Stroke Lettering*

Fig. 1.

"ball-point" pen most satisfactory; for medium sized let-

ters, not less than 2 millimeters high, he uses Soennecken's No. 108, and for small-sized letters, Gillott's No. 303, or Blanzy, Poure & Co.'s crow quill pen. All of these pens should be "broken-in" somewhat before being applied to lettering. As to the type of lettering to be employed, the slanting letter is well adapted to descriptive matter, dimensions, etc., while the upright letter will contrast well with the former type used as reference letters or sub-captions. A uniform pressure should be brought to bear upon the pen—a trick only acquired by practice. The pen should be held pointed forward, as in ordinary writing, and not sideways, as in "round writing." In lettering on tracing linen a sheet of black cross-section paper divided to millimeters, such as given on detached plate (IX), accompanying this book, will be found useful for giving the proper spacing, slant, etc. On drawing paper, pencil lines will be indispensable to the beginner.

A slope of 1 to  $2\frac{1}{2}$  is sufficient for the stems or down-strokes of the letters, and ordinarily an angle of  $45^{\circ}$  with the horizontal will suffice for the up-strokes and the axes of ellipses, excepting that of the letter "o." The latter angle will have to be increased, of course, when the

lettering is compressed, as shown in Fig. 2. In lower case letters, like "b" or "p," with parts extending above or below the main body of the letter, the length of these parts should be about  $2\frac{1}{2}$  the total height; the body of the letter representing 3 parts of the total height. The exception is the lower case "t," which is one part less in total height than "b" or "h," for example. In the illustrations following the incorrect forms of letters, as being constantly observed by the writer, are shown in brackets, and the correct method of forming each letter is shown beneath.



Fig. 2.

## Lower Case Letters.

The letters "n" and "m," Fig. 3, should be made with almost sharp upper corners; "u" is best formed by three strokes, as in this way parallel positions are secured for the straight lines, which should be made first, and these

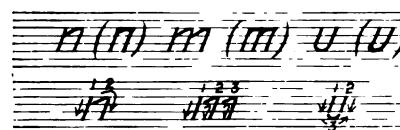
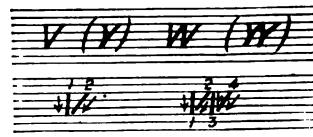


Fig. 3.

can be then joined by a lower curve. In forming the letter "v," Fig. 4, make the first stroke nearly vertical



and the second at an angle of about  $45^{\circ}$  with the horizontal.

The common error in making this letter lies in curving the two

Fig. 4. lines and giving the letter the appearance of a "y." The letter "w" is formed on the same principle as the "v." In putting in the short horizontal cross-line of the "t," Fig. 5, great care should be taken to use very little pressure upon the pen, as otherwise the ink will spread at the intersection of the two lines and make clean corners impossible.



The second part of

Fig. 5.

the letter "r" should be purely an up-stroke, slightly curved at its end. In making the letter "f," start with a curve extending down about one space; the "f" shown in brackets would come out with a heavy black knob

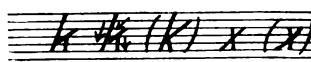


at top in any considerable reduction. The rule laid down

Fig. 6. for forming the "n" may also be applied to the letter "h," Fig. 6, and the down-stroke

for the "j" is practically the same as for the "f" reversed. Make bold, oblong dots over the "i" and "j."

The third stroke of the letter "k," Fig. 7, should be



vertical and begin at about the middle of the second stroke.

In constructing the letter "x,"

care should be taken to have the first stroke either vertical or leaning slightly backwards, and the second stroke ought to cross the first a little above its centre; in order to produce a clean intersection it may be well to make the latter stroke in two parts. The letter "y,"

Fig. 8, should be drawn on the lines of the "v,"



Fig. 8.

and from the point of the angle the tail should be drawn in exact line with the upper down-stroke, terminating, if desired, in a slight curve to the left to avoid the little blot of ink which would otherwise form at the bottom of the stroke. In this letter the second stroke may be modified as shown. The "z" is best drawn in one stroke, stopping the pen every time before changing direction. The letter "o," Fig. 9, is produced by two curved strokes, with their ends sufficiently bent, forming a perfect ellipse,

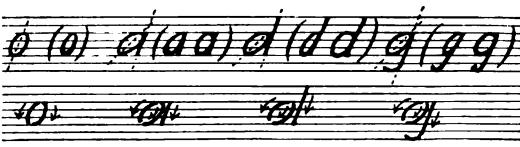
the axis of which lies in the direction of the down-stroke. The joining of these two curves, in this and similar letters, can be effected very neatly after a little practice.

The ovals of the following letters should be made somewhat narrower at the top than at the bottom, for obvious reasons; and especial care must be taken to have the axis of these ovals lie at an angle of  $45^{\circ}$  with the horizontal. For the purpose of increasing the width of the enclosed space at the bottom of the down-stroke and the oval, the right-hand curve should be somewhat flatter than the

opposite one.  
For the advantages of so doing

see Fig. 9.

Fig. 9.



these letters the down-stroke should be at exactly the proper angle, rather increasing this angle at the beginning, for the learner almost invariably makes the mistake of drawing this stroke too slanting. To further guard against this error, the beginner may slightly curve the end of the down-stroke towards the left, thus widening the angle at the bottom of the "a" and "d," and the down-stroke of the "g" should be made as long as possible in its

straight part by turning very short with the lower left-hand curve. The letters "p" and "b," Fig. 10, should be shaped exactly as inverted letters "d" and "q." With practice these letters can also be made to look well by using the oval of the letter "o."

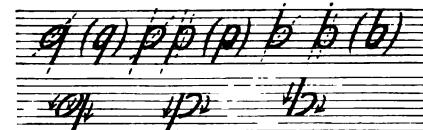


Fig. 10.

The letter "c," Fig. 11, is formed with one stroke, care being taken to have its general direction parallel to the down-stroke. The "e" is commenced in the same way, and the upper loop is formed by a second stroke

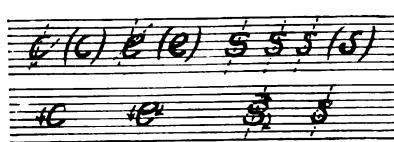


Fig. 11.

with the axis of the loop again at an angle of  $45^{\circ}$ . The beginning of the "s" is a very short curve from left to right at its apex; the rest is carefully joined on, turned down into a neat ogee curve and finished by a little crook upwards. The middle part of this letter should be nearly horizontal.

If a very narrow letter is to be produced, it may be constructed with one stroke and a flatter curve, making the upper curve somewhat shorter than the lower one.

In the ordinary letter a first separate stroke at the top is made necessary by the fact, that while turning in a horizontal direction from right to left and then descending into the ogee curve, the pen will either clog up and not give the required strength of line at one stroke or otherwise will in turning detach minute particles of paper or tracing-cloth saturated with ink and deposit them at the side of the stroke, necessitating erasures. The method outlined (employing two strokes) is therefore by far the simplest and quickest way of producing a clean letter, as experience will show. It will at first be a somewhat difficult matter to the beginner to lay the main axis of this letter parallel with the down-stroke, but this is nevertheless an essential point and should not be lost sight of.

## Capital Letters.

As in the rule laid down for the lower case letters, the capital letters will generally be five spaces high. Sharply defined, clean corners are again necessary, and to secure this the beginner may find it advantageous to curve the upper and lower ends of the down-strokes a little outwards.

The letter "A," Fig. 12, should be made in three strokes, with the second almost vertical. The cross-stroke should be placed low —about the middle of the second space from the bottom. The short third



Fig. 12.

stroke of the "E" should be slightly above the center of the letter, and should not be too short. The two down-strokes of the letter "H," Fig. 13, should be exactly parallel, and the horizontal stroke should be made as directed for the third stroke of the "E." If the capital "I" is to be followed by a lower case "l," two short horizontal strokes of even length and projection may be



added to the top and bottom. The second stroke of the letter

"K" should join the first at the top of the second space from the bottom, and the third stroke should join the second nearly one space higher up. The letter "L" can easily be made with one stroke, analogous to the forming of the same stroke of the letter "E."

The "J," Fig. 14, is commenced as a perfectly

straight down-stroke to the top of the lower space; then it turns to the left in a gentle curve, tangent to the base line, and finally rises to the top of the first space. The "M" is made with four separate strokes, putting in the two parallel lines first; the two other strokes should join at the top of the first space. If desired, this letter may be made slightly wider at the bottom than at the top. The letter "N" is also formed by drawing the two parallel strokes first. The horizontal stroke of the "T" should be neatly balanced on top of the down-stroke, and if it is not perfectly straight, as often is the case, a hardly noticeable crook downwards at both ends will improve it.

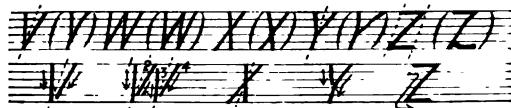


Fig. 15.

constructed precisely upon the lines laid down for the corresponding lower case letters, with the exception that they should be a trifle narrower in proportion. The "Y" is formed with two strokes without any lower crook to

Fig. 14.



the left; the "Z" is made in one stroke, with the axis of the letter in the direction of the down-stroke. If found easier, this "Z" can be made with three strokes. With practice the letters "P," "B" and "D" can each be formed with two strokes, with the curves terminating as shown. In forming the two curves of the letter "B," begin at the



Fig. 16.

top, and after joining the stem, return exactly on the horizontal while the ink is yet moist and complete the lower curve. The space enclosed by the lower curve should be somewhat larger than that in the upper one. The curve of the "D" should be parallel with the down-stroke in its middle third, but it may sometimes be advisable to make the lower part of the "D" a shade wider than the upper part. The first and second strokes of the "R" are identical with the letter "P."

The "C," Fig. 17, is formed with one stroke, nearly completing the ellipse of the letter "O," though this letter should be proportionately narrower than the lower case "c." In making the "G," a somewhat wider ellipse

is required, and this letter is most easily made with two strokes; the second horizontal stroke should be about

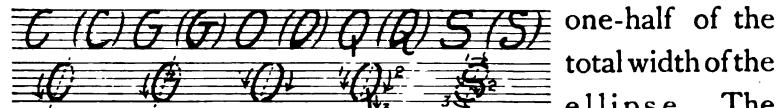


Fig. 17.

one-half of the total width of the ellipse. The capital "O" should be an almost perfect ellipse, special care being taken in joining the two curves. The third stroke of the "Q" should begin about the middle of the second space, and extend one space below the base. The letter "S" can be formed, for small-sized lettering, in two strokes, or with an additional stroke, as shown, for larger letters.

## Numerals.

As a rule, numerals should occupy the same height as capital letters, or five spaces, though the use of fractions may slightly

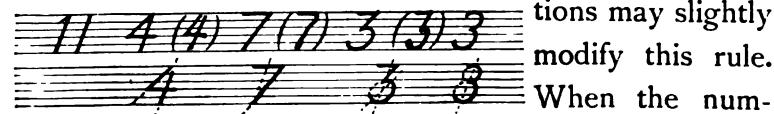


Fig. 18.

modify this rule. When the numeral "1," Fig. 18,

is used in proximity with "I" or "l," it is well to use a

short up-stroke at the top; otherwise, it may be represented by a simple down-stroke. The "4" is commenced with the stroke inclined at an angle of 45°, terminating at the second space from bottom and then turning sharply into the horizontal. The down-stroke should intersect the horizontal in such manner as to leave 3-5 of the horizontal to the left of the down-stroke. The "7" is best formed with one stroke, the down-stroke being on an angle of 45°. The "3" should be drawn in one stroke, beginning as with the "7" to a point a little below the top of the third space, and then curving into a portion of an ellipse, with an axial angle of 45°. Another type of the numeral "3" is shown, which can be made in one



Fig. 19.

The "0" Fig. 19, ought to be a perfect ellipse, like the capital "O." The "5" is commenced with the down-stroke, ending in the ellipse of the "3" and the horizontal upper stroke. The "2" can be constructed by one stroke, beginning at the top of the fourth space, nearly completing an oval with an axial angle of 45°, and then turning shortly into a down-stroke running into the base line, where a sharp

turn is made in a horizontal direction. The "6," Fig. 20, is commenced like the "o," except that its initial point is somewhat beyond the axis of the ellipse. For that reason the first stroke is very short, curving to the right; the second stroke decends nearly to the base, where a stop is



Fig. 20.

made, and the pen then returns in the same stroke, and, gradually turning to the right, nearly completes an ellipse with an axial angle of  $45^\circ$ , joining its lower part with the bottom of the incomplete second stroke. The figure "8" is commenced with an ogee curve, using a slight crook at its lower end, and is finished by two other curves, as shown. The lower loop should always be somewhat larger than the upper one. The numeral "9" is made in two strokes. The ellipse at the top is nearly finished in one stroke when the down-stroke is assumed, which, beginning at the initial point of the ellipse and completing the letter, terminates with a somewhat fuller curve than that employed in lower case "g."

Though Roman numerals are seldom employed on working drawings, they may sometimes be required. The chief requisite is to so form them that they are neat

in appearance and easily distinguished from the rest of the text. They should be of the same height as the Arabic numerals, and short horizontal strokes should be used with them, as indicated in Fig. 21.

Fig. 21.

In the modified forms shown in Fig. 22 it will be noticed that all the letters and numerals are based upon the general form of the letter "o," modified to suit demands. The second stroke of the "r" is really a part

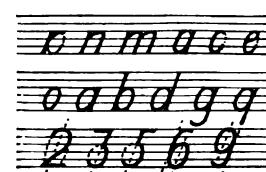


Fig. 22.

of the elementary ellipse, as are also the second stroke of the "n" and the second and third strokes of the "m." The "u" is here made in two strokes—the first, a down-stroke with the curve attached, and the second a straight down-stroke, tangent to and touching the curve.

The numerals follow similar lines of construction. The "2" begins at the upper part in an ellipse and ends in a down-stroke, laid at an angle of  $45^\circ$ , turning sharply to the right in a horizontal line. The "3" is formed with one stroke with its lower curve, as also that of the

"5" and "6," encircling somewhat more than half of the ellipse. In the "6" and "9" care must be taken to have

the curved down-strokes only tangent to the respective ellipses and not cutting off a portion of the latter.

## UPRIGHT LETTERING.

Upright lettering is employed most advantageously for reference letters, designating lines of section, and for captions. In some instances however, it may be deemed advisable to use uprights also for such descriptive matter, dimensions, etc., to which some prominence is to be given, though, as a rule, the slanting lettering will answer this purpose very well.

The relative height of the letters ought to remain the same as that of the inclined lettering. The down-strokes should be perfectly vertical, and in order to produce this effect properly, it will be best for the beginner to form the habit of making the letters at first lean over somewhat to the left at the top, as the natural tendency would be to have them lean the opposite way. It will

be noticed that in some of the uprights a comparatively greater number of strokes is required, as many portions of these letters are being executed in a horizontal direction or nearly so. The letters are again simplified as much as possible, a fact which will be especially noticeable in the lower case "a" and "g," which, though at variance with the ordinary gothic print, look fully as well.

### Lower Case Letters.

In the letters shown in Fig. 23, the same number of strokes is employed as in the slanting lettering previously described. The letters are as a rule made wider than those of the slanting type. The second stroke of

the "n" and the two last strokes of the letter "m" are started with a very slight curve in an upward direction rounding off the corner at the top, making it somewhat more full than in the corresponding slanting letters. The letter "u" is made in three strokes as usual, connecting the

Fig. 23.

two down-strokes with a well shaped curve. If preferred, however, the ordinary form of gothic lower case "u," as shown, may also be employed. In constructing the letter "v," the two slanting strokes ought to make the same angle with the vertical. The beginner will invariably construct the second stroke at a greater incline than the first, and will do well to guard against this habit, until after some practice the hand will become accustomed to form the point of juncture of the two strokes equidistant from their starting point. The letter "w" is composed practically of two somewhat narrowed "v"s.

The letter "l" (Fig. 24) is sometimes constructed with a lower crook to the right, when used at the side of capital letter "I," otherwise it is made as a down stroke



pure and simple. The second stroke of the "r" starts from the top of the second space upwards as a very slight curve, similar to the one forming first part of the second stroke of letter "n." Letter "f" is best formed by three strokes; the first a very short curve to the right, being joined by the second or main stroke. The horizontal third stroke should be made sufficient-

Fig. 24.

ly prominent. The letter "j" ought to extend two spaces below the base line and should be made in one stroke, being perfectly straight until the point of curve is reached. If found easier, however, a second right hand stroke, forming the curved portion, may be employed. The latter should be almost a semicircle and one space high.

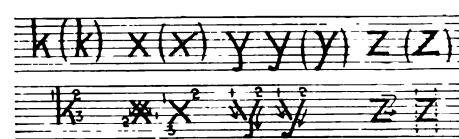


Fig. 24.

The second stroke of letter "k" (Fig. 25) should extend down to nearly the first space.

The third stroke begins at about the centre of the second one. The letter "x" is constructed with two strokes, making the first

one apparently more inclined than necessary for reasons explained above. When the pen is very full, the second stroke may be made in two parts, as shown, thereby preventing the forming of a clot of ink at the intersection of those two strokes. The upper part of letter "y" forms a perfect "v." The second stroke may either be executed with a slight angle terminating in a vertical direction, or in a perfectly straight inclined line, according to the draftsman's individual taste. Letter "z" is as usual formed in one stroke; its starting point should be vertically above the point of turning into the horizontal.

The ellipses of the letters shown in Fig. 26, are as usual constructed in two strokes, joining the respective initial and terminal points carefully. The first curve starts in an almost horizontal direction towards the left and terminates similarly at the right, thus preventing the forming of a point at the top and bottom junctures. The second (right hand) stroke of the ellipse ought to be made apparently more curved than necessary, as that portion is invariably made too flat by the beginner.

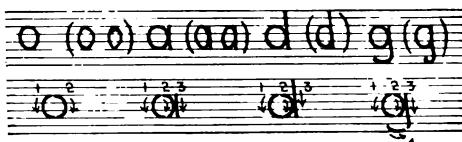


Fig. 26.

The ellipses should be made quite full. The vertical down-strokes of letters "a," "d" and "g" ought to run tangent to their ellipses so that the thickness of the second curve at the joint of juncture is not increased. The curved portion or the fourth stroke of letter "g" extends to the left almost or nearly the full width of the oval of this letter.

The mode of construction of letters "q," "p" and "b" (Fig. 27) offers no novel features. If the pen, while rounding in the lower part of the curve of letters "p" and "b," should contain too much ink, the curve may be completed by a third stroke, running in an opposite direction, as shown, as in turning into the lower portion of the curve a somewhat greater pressure is involuntarily brought upon the pen, resulting, if too full, in a badly proportioned lower end.

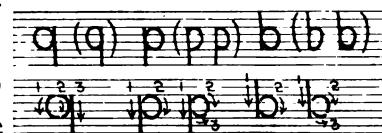


Fig. 27.

Letters "c" and "s" (Fig. 28) are started with a short curve towards the right; the upper end of letter "c" should be slightly more curved than the lower one; still, the form of the perfect oval should be predominant in this letter. The letter "e" is constructed in three strokes.

If, as is sometimes the case, the upper part of letters "c" and "e" should not precisely fill the allotted space, or otherwise they should appear too narrow, a flattening

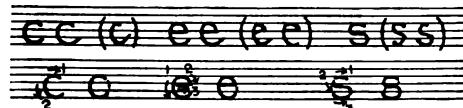


Fig. 28.

help matters and otherwise not at all injure their appearance, as shown. The completed ovals of letter "s" should, as in the inclined one, form a perfect figure "8." If at all uneven, the lower oval should be made more prominent than the upper one.

## Capital Letters.

Upright capitals are, as a rule, 5 spaces high, with the exception of the "Q," the appendix of which ought to reach one space below the base line. These letters should be made narrower in proportion than the corresponding lower case letters.

The second stroke of letter "A" (Fig. 29), should be made rather more inclined than the first one by the beginner. The first strokes of letters "E" and

of the lower portions of the curve, making those letters appear leaning backward, will

"F" must be made perfectly vertical or leaning backwards, as even the slightest inclination forward in these two letters will be painfully noticeable, especially in the "F." The length of the short third stroke in the "F," is generally depending on the shape of the succeeding



Fig. 29.

(lower case) letter; shorter, if the latter begins with a vertical stroke, longer, if an oval or inclined stroke is to follow. We will not attempt, however, to lay down any definite rule on this point, as the determining factor in each case should be the draftsman's eye and good taste. Letter "Z" is best formed in one stroke, care being taken to make especially the inclined portion perfectly straight.

The letters comprising Fig. 30 are constructed upon nearly the same principles given in the case of the corresponding slanting capital letters. The termination of the last stroke of letter "K" should



in a well formed letter be vertically below the initial point of the second stroke. The length of

Fig. 30.

the horizontal portion of the "L" is again, as in the case of the "F," determined by the succeeding (lower case) letter. It is obvious, that by unduly lengthening that portion of the letter, an unproportionally wide space will result between its vertical part and the succeeding letter.

The curved part of letter "J" (Fig. 31) ought to be a well shaped semicircle, beginning and ending not above the middle of the second space. The second and third strokes of letter "M" converge at the second line, and this point should, of course, be at an even distance from the vertical strokes.

To attain this end  
exactly some drafts-



men will perhaps

Fig. 31.

find it easier to put in the two verticals first and the oblique strokes afterwards, as in the construction of the letter "N." The angles in those two letters should be sharply defined, the strokes forming them ending in a clearly cut, though somewhat blunt point. The second horizontal stroke of letter "T" ought to be evenly balanced upon the main or down-stroke.

The construction of the letters shown in Fig. 32 is

chiefly guided by the principle that the rate of inclination of the slanting strokes should be uniform in each letter. In the case of the "V" and "W" care should be taken that only the center



Fig. 32.

lines of the inclined strokes join at the base or top lines of the ruling, thus avoiding two extremes, either the formation of a vertical short end or the reverse, a flattened-out point. This is made apparent in the

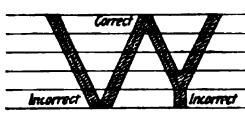


Fig. 32a.

small illustration, Fig. 32a. The first and fourth strokes of letter "W" ought theoretically to be made parallel to the second and third; but as the latter two strokes are involuntarily made more upright than the first one, the fourth stroke should again be made more slanting to correspond with the first. The reverse mode of procedure would result in a badly shaped letter, as shown alongside. Letter "X" is usually made in two strokes, or, if preferable, a stop may be made in the second stroke shortly before crossing the first, continuing it on the other side, avoiding thus the forming of a lump of ink at the point of intersection.

The two inclined parts of letter "Y" should join on the top of the second space; from these the second stroke is continued in a vertical direction down to the base line.

Letter "P" (Fig. 33) is constructed in two strokes,



Fig. 33.

fully rounding the curve and joining the first stroke again at right angles as a perfectly straight line. The third stroke of letter "B" begins at the point of curve of the second, enclosing as lightly larger area than the second one. The second stroke of letter "D" should begin and terminate in a horizontal direction. If a slight "sagging" should happen in the curve, it ought to be near its lower portion. The rule given for the forming of the second stroke of letter "B" applies also to letter "R"; its third inclined stroke begins at the point of curve of the second. The two vertical strokes of letter "U" are made first; a right hand carefully formed semi-circular curve connects the two.

Letter "C" (Fig. 34) is made with two strokes, and is

simply a repetition of the lower case letter, relatively narrower. The second stroke of letter "G" follows the



Fig. 34.

outline of the oval upwards nearly a space; there a short stop is made and the pen point is carefully pushed upwards in a vertical direction, terminating that stroke as shown. The final horizontal stroke should not be made too short. To those who might find it difficult to execute the second stroke neatly in the way outlined the suggestion of a separate vertical downward stroke is made. The mode of construction of the ovals of the "O" and "Q" differ somewhat from that of the lower case letters; the point of juncture is shifted diagonally in order to lessen the chance of a point forming at the top and bottom of the oval. The third stroke of letter "Q" begins as shown and extends one space below. The second stroke of letter "S" should for a very short space run perfectly horizontal. The rules given for the forming of the lower case letter otherwise apply to this letter also.

## Numerals.

Upright numerals ought to be like the inclined ones, five spaces high. Figure "1" may again, if used in proximity with capital letter "I" or lower case "l," be constructed with a very short up-stroke. Numeral



"4" is started

Fig. 35.

with a perfectly straight inclined downstroke, as shown, whence it assumes a horizontal direction. The rule given above and illustrated by Fig. 32a on the forming of a clear cut angle, applies to the top part of this figure especially. The lower terminal point of numeral "7" should, in a perfectly formed figure, be vertically below the center of the horizontal portion. The upper part of numeral "2" ought to form portion of a flattened oval. The mode of its construction is clearly shown in the illustration, Fig. 35.

Numeral "5" (Fig. 36) begins with a vertical stroke to nearly the middle of the third space; from there the stroke follows the outline of the oval, which is to be three spaces high. The middle portion of the second

stroke of numeral "6" ought to follow the vertical direction a short distance, as the general tendency in constructing this figure is to



Fig. 36.

have that part too much curved. The third stroke ought to enclose a perfect ellipse. Numeral "8" is formed in three strokes; its first a well-shaped ogee curve, with its middle portion running very nearly horizontal. The first stroke of numeral "9" ought to be part of a perfect ellipse and comprising as it does, nearly two-thirds of its circumference, is somewhat difficult to construct. The middle portion of the second stroke should for a short distance, run almost vertical.



The upright Roman numerals,

Fig. 37, are constructed, analogous to the inclined ones, with upper and lower short horizontal strokes. After explaining the mode of forming of capital letters "V" and "X," nothing new can be said concerning these, except that as a general rule it will be well to make them a trifle narrower in proportion.

## Extended Form of Upright Lettering.

In the following illustration, Fig. 38, the upright lettering is shown in extended form. It will be noticed that

for the construction of some of those letters a comparatively greater number of strokes is required. The axes

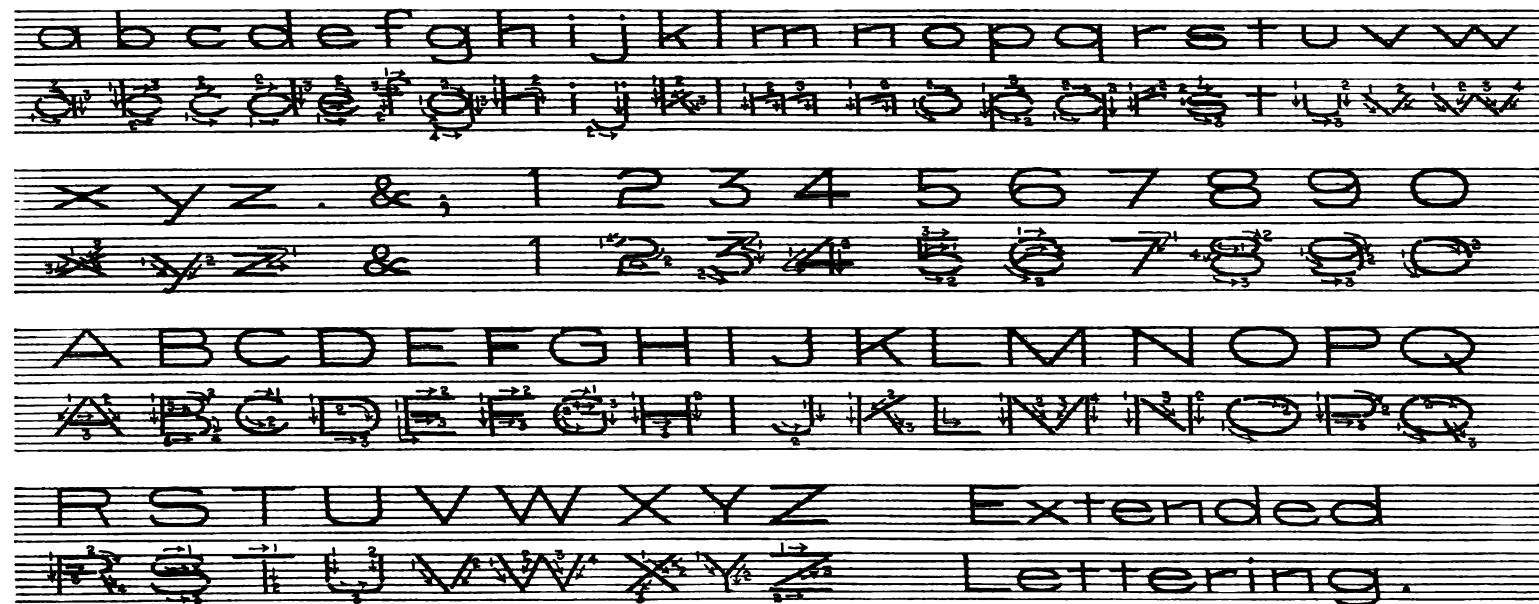


Fig. 38.

of the ellipses lie in a horizontal direction in every case, and it will be well to shape parts of the curves, composing them, decidedly flat, sometimes going to the extreme to have the top and bottom parts of the ellipses running perfectly straight for a certain distance.

The complete alphabets of the slanting and upright type are shown in plate I., together with samples of lettering as used on working drawings. The single letters, composing a word, should, especially in slanting lettering, be placed as close as possible, so close, in fact, that they sometimes nearly touch each other. If this principle is followed out at first, the golden middle governing the spacing of letters will soon prevail. The beginner generally spaces his letters too far apart. Sufficient space should be allotted between different words.

In expressing fractions, the accepted custom is to place a horizontal dash between numerator and denominator, excepting the instance when numeral "4" happens to be the latter, in which case, for obvious reasons, a slanting dash is employed. The several lines

of lettering composing a sentence, for instance, should be placed rather close.

## Freehand Lettering applied to Working Drawings.

Lettering as applied to working drawings, should be bold, clear and uniform in size, with the exception of the sub-captions which may be a trifle larger. Diminutive and cramped lettering on a drawing will never look well.

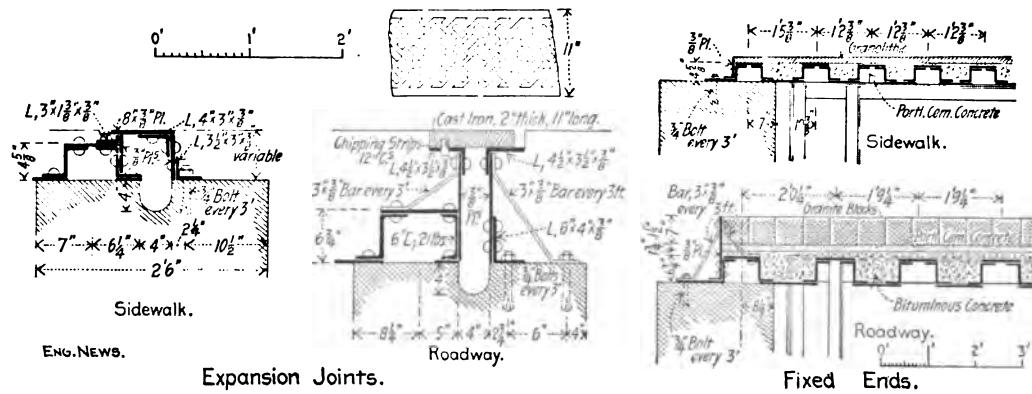


Fig. 39.

If possible, the lettering should be kept distinctly by itself and never be allowed to run across lines. If some

angle, its base should be reversed in such a way that it can be read from the lower left hand corner; if the

angle be smaller, one should then be enabled to read it from the lower right hand corner, as Fig. 43 demonstrates.

Dimensions should be placed between, not on top, of dimension lines, and an appropriate space left open while drawing those. If the space allotted for a dimension is too small to place the same comfortably between arrow heads, the figures should be written outside, parallel to dimension line, and reference line used. Arrow heads

should be bold, with even sides, the two strokes composing them tapering in thickness from the point;

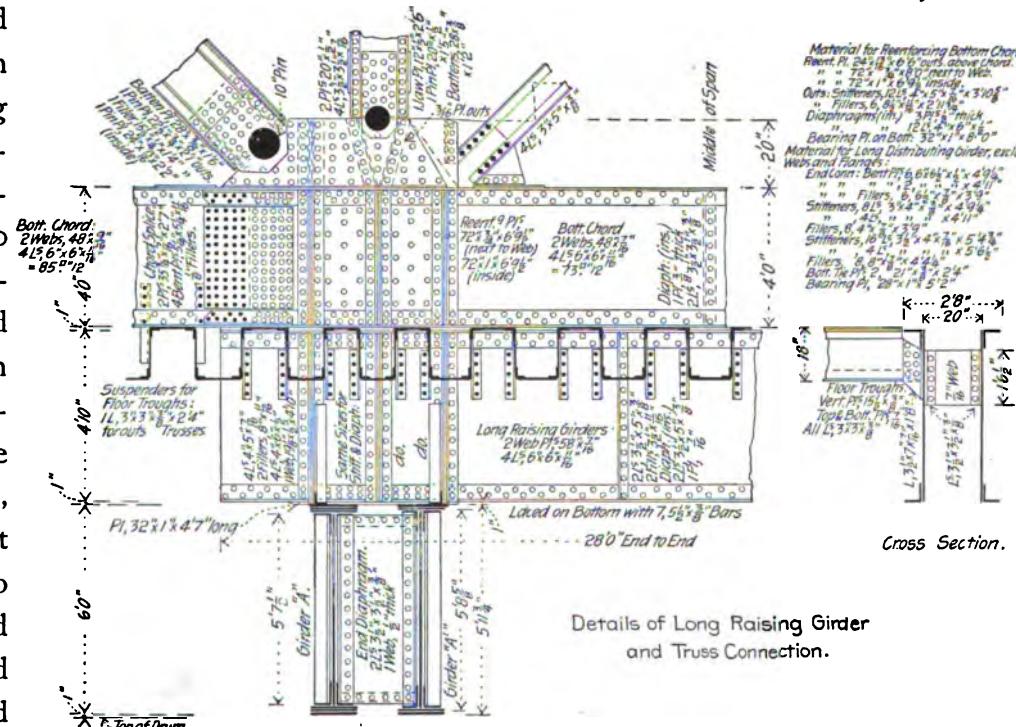


Fig. 40.

"lop sided" arrow heads should be avoided. Notes referring to drawings should run parallel to base of sheet and be used as "fillers."

of the two alphabets above described, are employed. Letters relating to rivers and railway lines should be placed parallel to those objects. Otherwise lettering

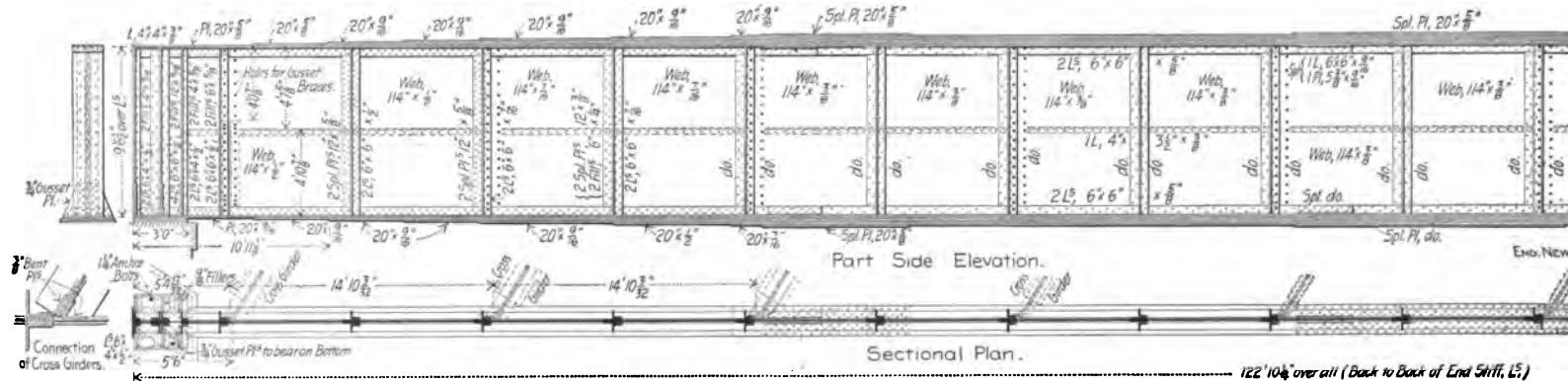


Fig. 41.

In Fig. 42 and Plate II. lettering as used on sketch maps is shown. Here four distinctive styles, composed

in straight lines is resorted to. If this should, however, be impracticable, lettering on neat curves is used.

## VARIOUS FREEHAND ALPHABETS.

The principles of construction of the shaded inclined (Italic) lettering, shown on Plate III., which is occasionally used on working drawings and maps, are practically the same as given for the ordinary slanting lettering. The relative height of letters and inclination of down-stroke remain unchanged. A fairly fine pointed, rather flexible pen should be used, for instance, Gillott's No.

303. The lower case letters are very much like common English shaded script. The shading is produced by an even pressure exerted upon the pen, which in turning

into curves, is gradually released at the proper moment. In shading letters "S" and numerals "2," "7" and "8" the pen has to outline and shade the curves at the same time, necessitating a slight turning motion of the holder, to the beginner a somewhat delicate operation at first. It will be noticed, that every second row in the upper portion of this plate is devoted to demon-

strating the proper method of forming each letter and the sequence of strokes. After all that has been said about slanting lettering in general, no trouble

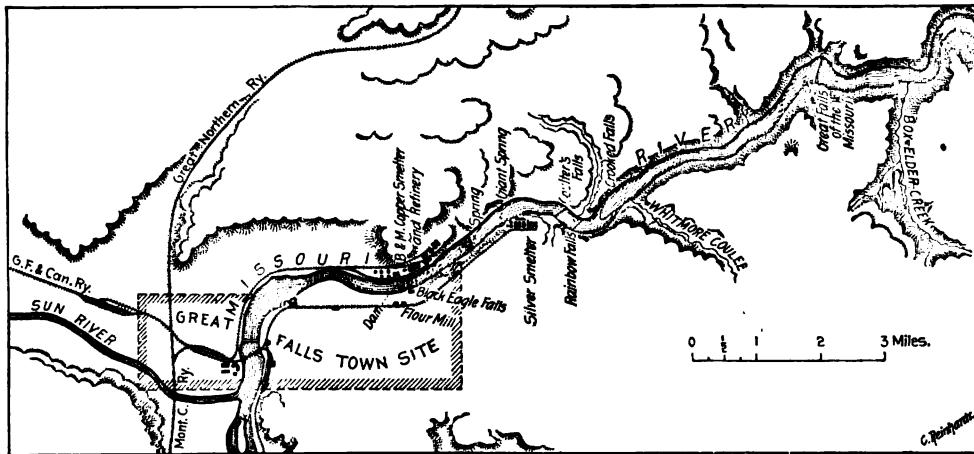


Fig. 42.

will be experienced in constructing these letters satisfactorily.

When reduced considerably, Italic lettering, as a rule, does not show up so well as the same size of the ordinary slanting type described before, the light lines in that case dropping out, leaving only the shaded portions visible.

is in fact only a modification of the ordinary upright freehand letterings, and used as a part of title, looks

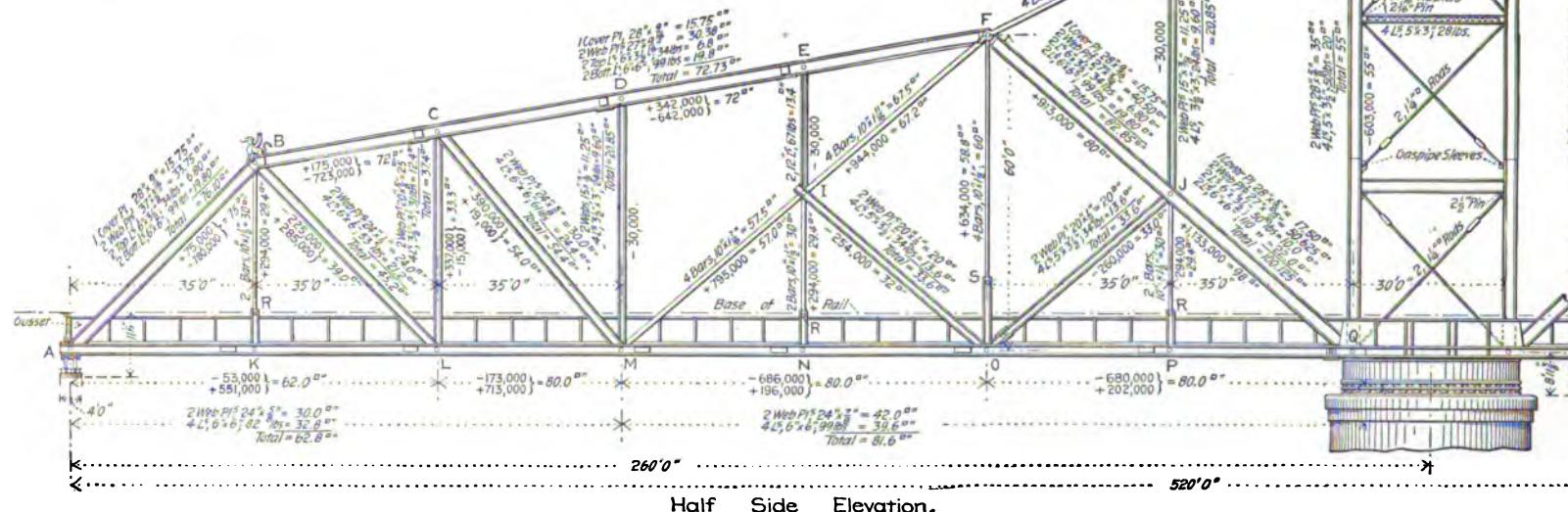


Fig. 43.

The type of lettering shown in lower part of Plate III,

very well when used with the black faced Gothic letter-

ing, shown on Plate V. As is known to every draftsman, a lump of ink is apt to form at the end of a straight stroke, when the pen is fairly full. This propensity of the ink is made use of in constructing this type of lettering and the flow of ink thus diverted. The relative number of strokes remains the same, as with the ordinary uprights. A few modifications are introduced in the shape of lower case "a" and "g." This lettering is best produced with a ball point pen, insuring a stroke of almost uniform strength. As a precaution, it may be said that the pen should never be too full while making this type of lettering.

Plates IV. to VII. inclusive, contain Freehand Lettering suitable for main titles, which may easily be constructed by dividing the space to be lettered into squares and sketching in the letters in outline afterwards as shown; on tracing linen, cross-section paper may of course be used for this purpose. A draftsman able to satisfactorily construct the upright lettering, the principles of which have been exhaustively explained in the foregoing, will experience no trouble whatever in sketching these letters in good shape. As shown, the relative height of lower case and capital let-

ters remain unchanged; the width of the body of the capital may be taken as 4-5, in some cases 7-8, that of the lower case letters as 3-5 the width of a square. On Plates IV and V suggestions are made as to several methods of shading these letters, although, as a rule, they look very well without it. If, as the case may be, the draftsman should desire more ornamental letters, he will be able by the aid of his eye and the exercise of some good taste, to devolve the letters desired out of the types given. It should, however, be borne in mind, that a title, composed of highly ornamented letters, does not make up for any poorly drawn and lettered sheet to which it may be attached, but on the other hand, a simple title, constructed of well executed letters of reasonable size, with the several lines composing it well centered, will make an ample heading for any well executed drawing.

The writer would not consider this work complete without giving passing notice to

### Round Writing,

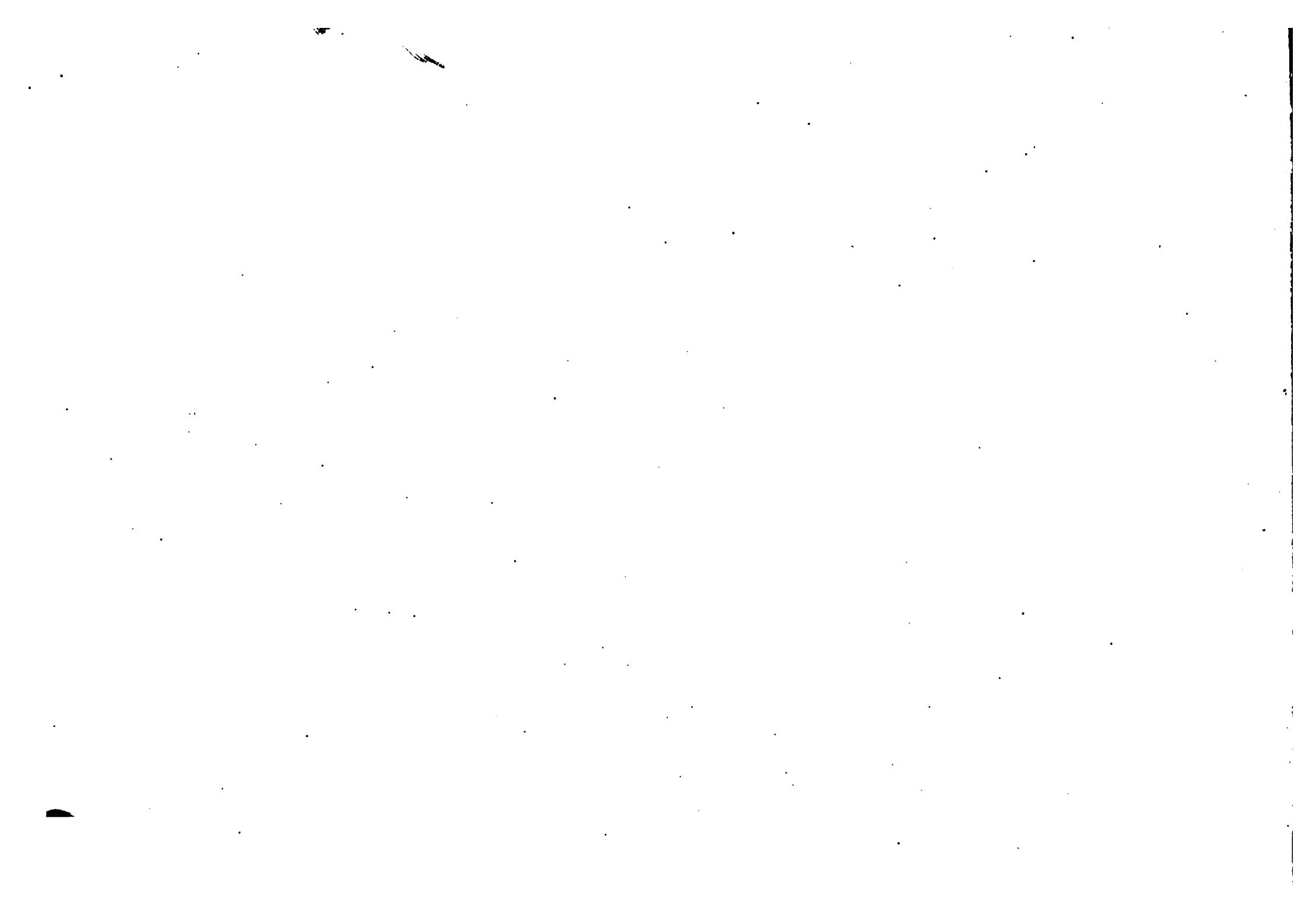
the principles of which are shown on Plate VIII. For the production of this kind of lettering regular round

writing pens are used, although very satisfactory lettering of this type can be produced with goose-quills cut by the draftsman, and the writer even yet prefers the latter.

In Fig. 44 an actual facsimile of a title once met with,

is exhibited. It explains in short how not to do it, and shows the draftsman's lack of practice in freehand work, while relying solely upon his skill with bow pen and ruling pen.

Sheet ~~No~~ 2  
NO. 16  
END AND SECTIONAL VIEW  
OF  
EUREKA DRIERS  
  
LONGITUDINAL SECTION  
Fig. 44.



abcdefghijklmnopqrstuvwxyz., 12345678910. 1894.

ABCDEFGHIJKLM NOPQRSTUVWXYZ. Ordinary Type.

IIINVVVIIVVIIIIXX. Details of Cross Framing. CROSS SECTION OF GIRDER.

Extended Lettering. LONGITUDINAL SECTION. &.

Compressed Type. INTERSTATE BRIDGE. Spur Wheel, 32" Diam., 7" Face,  $3\frac{9}{64}$ " Pitch, 32 Teeth, 5.2 Revs.  $9\frac{3}{4}$ " turned Pin, 36" long.

abcdefghijklmnopqrstuvwxyz. 12345678910.  $13\frac{7}{8}$ ",  $\frac{15}{16}$ ",  $\frac{3}{4}$ ".

ABCDEFGHIJKLM NOPQRSTUVWXYZ. IIINVVVIIVVIIIIXX.

Ordinary Lettering. I Beam. Eye Bar.  $4L^s, 6" \times 6" \times \frac{11}{16}" = 85.12"$  2 Webs,  $48" \times \frac{7}{16}"$ .

Extended. 95 Ft. Span. End View. etc.

Compressed. 1, 12" L, - lbs. per yd. NEW YORK CENTRAL.  $2\frac{3}{4}$ ,  $5\frac{7}{32}$ ,  $\frac{7}{8}$ " Bolt, Outer Elevation. &

Material for Reinforcing Bottom Chord:

1 Reenf. Pl.,  $24" \times \frac{13}{16}" \times 6'6"$  outs. above Chord.

1 " ",  $72" \times \frac{3}{4}" \times 8'0"$  next to Web.

1 " ",  $72" \times 1" \times 6'9\frac{1}{2}"$  inside.

Outs. Stiffeners,  $12L^s, 4" \times 5" \times \frac{7}{16}" \times 3'10\frac{5}{8}"$

" Fillers,  $6'8\frac{1}{2}" \times \frac{11}{16}" \times 2'11\frac{3}{4}"$

Diaphragms (Ins.), 3 Pls,  $\frac{1}{2}"$  thick.

Material for 1 Chord Section:

2 Web Pls,  $24" \times \frac{5}{8}" \times 25'0"$

2 " ",  $16\frac{1}{2}" \times \frac{9}{16}" \times 25'0"$

1 Lat. Brace Pl.,  $37" \times \frac{1}{2}" \times 6'0"$

2 " ", Pls,  $11\frac{1}{2}" \times \frac{1}{2}" \times 1'10\frac{1}{2}"$

4 Batten Pls,  $15" \times \frac{3}{8}" \times 2'1"$

4 Ls,  $4" \times 3\frac{1}{2}" \times \frac{5}{8}" \times 25'0"$

The Samples of Lettering on Lower Portion of this Plate show approximate Spacing of Lines and also Mode of Crowding in Fraction Numerals.

It will also be seen that it becomes necessary to occasionally shorten a Capital or longer Lower Case Letter. Occasional Brackets or Horizontal Dashes are best made Free Hand, the latter with a slow, "wobbling" Stroke of the Pen.



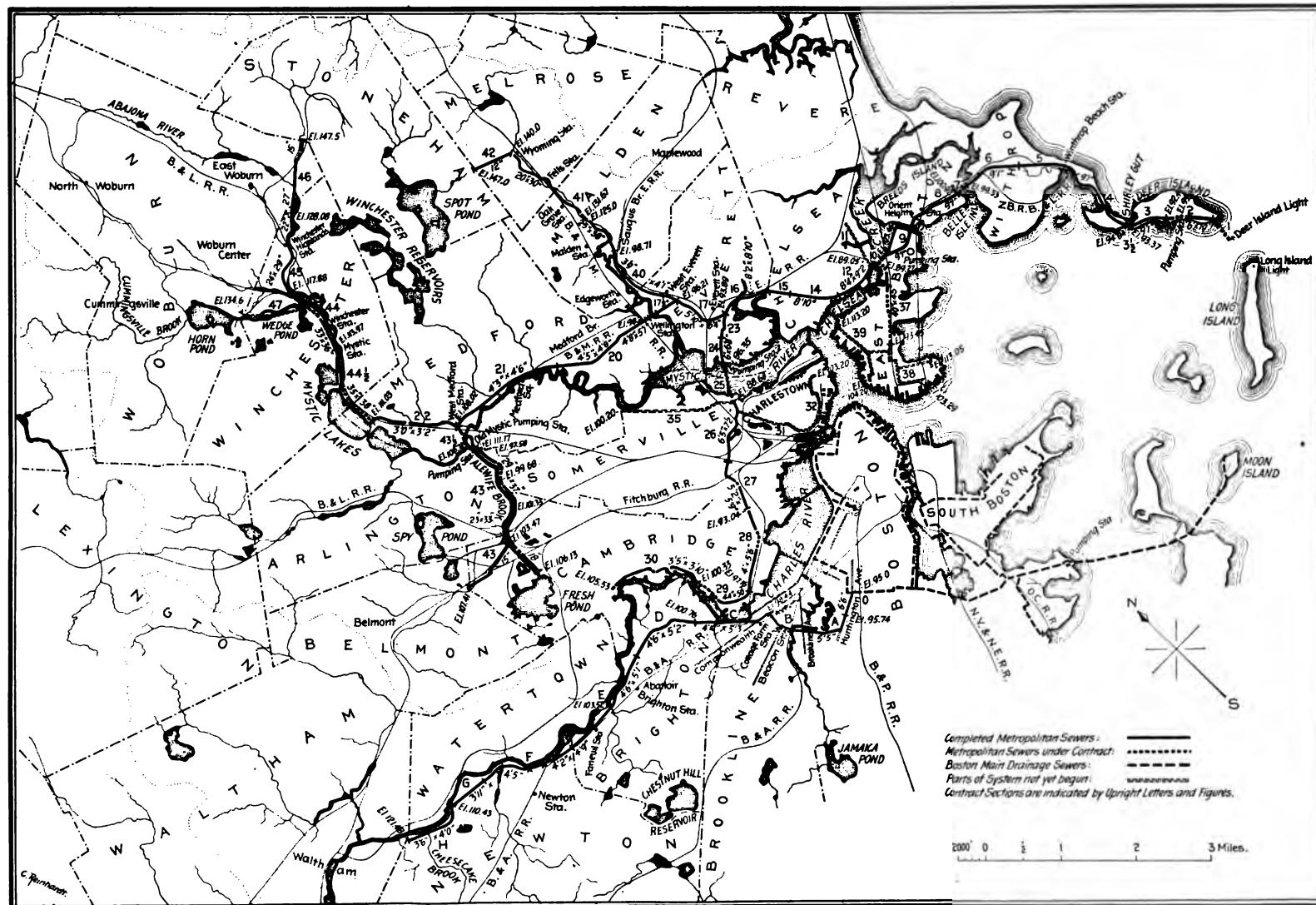


PLATE II.



## *Shaded Inclined (Italic) Lettering, Used for Working Drawings.*

a b c d e f g h i j k l m n o p q r s t u v w x y z  
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z  
1 2 3 4 5 6 7 8 9 10.

## Freehand Lettering for Captions, Produced very Fast.

# THROUGH PASSENGER SERVICE; etc.





PLATE IV.





A B C D E F G H I J K L M  
N O P Q R S T U V W X Y  
0 1 2 3 4 Z 5 6 7 8 9  
a b c d e f g h i j k l m  
n o p q r s t u v w x y z



ABCDEFGHIJKLM  
NOPQRSTUVWXYZXY  
01234Z 56789  
a b c d e f g h i j k l m  
n o p q r s t u v w x y z



ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
01234 Z 56789  
abcdefghijklm  
nopqrstuvwxyz



a b c d e f g h i j k l m n o p q r s t  
 u v w x y z. 1 2 3 4 5 6 7 8 9 10; &c. Scale  $1\frac{1}{2}'' = 1$  ft.  
 A B C D E F G H I J K L  
 M N O P Q R S T U V W X Y Z.

800 ft. Lock  
 St. Mary's Falls Canal, Mich.

Plan and Elevation of  
 Lock Walls and Floor.

Drawn under the direction of:

August 1892.

Scale:

The Capital Letters should be made twice the size of the small Lower Case Letters.

The Axis of Portions of Ellipses and the light Upstrokes should in the latter lie at an Angle of  $45^\circ$ . In Capitals the Inclination is somewhat less.





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